Module 12 Lab Activity: Factorial Designs
PSY 652 Research Methods
Nov 18, 2020

Description of the dataset:

A team of sleep researchers sought to study the effects of a 6-week sleep intervention aimed to improve participant's sleep hygiene. Sleep hygiene encompasses a variety of practices and habits that are necessary to have good nighttime sleep quality and full daytime alertness. The team formulated three different versions of the intervention. The first version (condition 1) provided participants with a self-help book on the topic of sleep hygiene. The second version (condition 2) brought participants together once per week in groups of 10-12 to teach the principles of sleep hygiene in a classroom setting. The final version (condition 3) also used the group-based classroom setting of condition 2, but in addition, each participant's partner was invited to also take part in the group sessions. Six-hundred male and female adults living with an intimate partner and suffering from a sleep disorder were recruited to take part in the study, the participants were randomly assigned to one of the three conditions. The data set includes the following variables:

- **sex**: 1=male, 2=female
- **age**: Participant's age in years
- **anxiety**: Participant's level of general anxiety measured at the start of the study via a multi-item scale. The scale (average of all items) ranges from 1 to 7, where a higher score indicates a higher level of anxiety.
- **prior**: An indicator of whether or not the participant had previously participated in some type of sleep intervention, 1 = yes, 0 = no.
- **hygiene**: Participant's sleep hygiene at week 6. It ranges from 0 to 10, and higher means better sleep practices.
- **support**: Participant's perception that their partner is supportive of their struggles with sleep and their efforts to improve sleep. It is a multi-item scale that ranges from 1 to 5, where higher indicates more support.
- **sleep**: Participant's average sleep efficiency during the month following the intervention, calculated as time spent in bed asleep (minus all the awakenings), divided by the total time spent in bed. It is expressed as a percentage.
- **lifesat**: Participant's sense of life satisfaction measured 30 days after the completion of the intervention. It is a multi-item scale that ranges from 1 to 7, where a higher score indicates more satisfaction.
- **cond**: Treatment condition, 1 = self-help, 2 = group-based intervention, 3 = group-based plus partner participation.

Assignment instructions:

1. Download the “slpdata.csv” dataset from the Module 12 Lab module and save it into a project folder.
2. Create a new R notebook and name the file.
3. Create a new R chunk with a first level header: “Load Libraries”
    a. Load the psych, tidyverse, apaTables, car, lsr and MBESS packages (you will probably need to install some of these)
4. Create a new R chunk with a first level header: “Import Data”
    a. Read in the “slpdata.csv” dataset, assign it to an object named “slp”
5. Create a new R chunk with a first level header: “Factor the grouping variables”
    a. Factor the sex variable so that male takes on level 1 and female takes on level 2. Name this newly factored variable sex.f
    b. Factor the cond variable so that 1 = “self-help”, 2 = “group-based”, and 3 = “group + partner”. Name this newly factored variable cond.f.

Hint:

```
data <- mutate(data, variable.f  = factor(variable, levels = c(1,2), labels = c("level1", "level2")))
data <- mutate(data, variable.f = factor(variable, levels = c(1,2,3), labels = c("level1", "level2", "level3")))
```

6. Write a first level header: “Calculate descriptives”
    a. Create a new R chunk with a second level header: “For whole dataset”
        i. Use any method to calculate descriptives for the slp dataframe
    b. Create a new R chunk with a second level header: “Descriptives by grouping variables”
        i. Use a combination of group_by() and summarize() to calculate the outcome variable of sleep efficiency by sex.f & cond.f
7. Write a first level header: “Visualize the data”
    a. Create a new R chunk with a second level header: “Create boxplots of sleep efficiency across treatment groups”
        i. Create three boxplots on one plot comparing the treatment conditions on the outcome variable of sleep efficiency.

Hint:

```
ggplot(dataset, aes(y = outcome, color = groupvar1)) +
    geom_boxplot()
```

    b. Create a new R chunk with a second level header: “Create boxplots of sleep efficiency across sex”
        i. Create two boxplots on one plot comparing sex on the outcome of sleep efficiency.
    c. Create a new R chunk with a second level header: “Create boxplots of sleep efficiency across treatment groups and sex”

i. Create 2 graphs of three boxplots each comparing the conditions, faceted by gender.

Hint:

```
ggplot(dataset, aes(y = outcome, color = groupvar1)) +
    geom_boxplot() +
    facet_wrap(~groupvar2)
```

8. Create a new R chunk with a first level header: “Conduct a factorial ANOVA”
    a. Conduct a 2-way independent ANOVA in which sleep is regressed on sex.f, cond.f, and the interaction between these two predictors.
    b. Use the Anova() function to output the results as a Type III ANOVA
    c. In the white space, answer the following:
        i. Interpret the *F* statistic for each predictor and for the interaction effect.
9. Create a new R chunk: “Output an APA styled ANOVA table via apaTables’ apa.aov.table() function
    a. Using the apa.aov.table() function, output the same ANOVA table to a word document.

    Hint: apa.aov.table(model, filename = “filename.doc”, conf.level = .95)

    b. In the white space, interpret the partial η^2 values for each main effect and the interaction effect (The partial eta squared values were outputted with your apa.aov.table function).

10. Create a new R chunk with a first level header: “Calculate partial eta^2 confidence intervals via MBESS’ ci.pvaf() function”
    a. Use the ci.pvaf() function from the MBESS package to calculate 95% confidence intervals for the partial η^2 values for the sex.f variable, the cond.f variable, and the interaction between the two (You will calculate 3 total confidence intervals).

    Hint:

    ci.pvaf(F.value = *Fvalue*, df.1 = df_{hyp}, df.2 = df_{err}, N = *SampleSize*, conf.level = .95)

11. Create a First level header: “Run contrasts”
    a. In a new R Chunk, Create 3 sets of contrast statements:
        i. The first comparing males (1) to females (-1) in your sex.f variable
        ii. The second comparing the self-help (1) condition to the group-based (-1) only condition
        iii. The third comparing the self-help condition (1) to the group-based + partner condtion (-1)
        iv. Add your newly created contrast statements as an attribute to the sex.f and cond.f variables.

v. Hint:
    1. contrasts(dataset$variable) <- contrast
    2. contrasts(data$variable) <- cbind(contrast1, contrast2)

12. Create a first level header: Run ANOVA with contrast statements
    a. Create another ANOVA model including your contrast statements
        i. Use summary.lm() to compare your model with the contrast statements included.
        ii. Interpret these contrasts.

13. ***OPTIONAL STEP!***: Create an interaction plot (via ggplot() or interaction.plot()) of the model
    a. Hint:

Via ggplot:

```
Data_grouped <- group_by(data, groupvar1, groupvar2)
Data_graph <- summarize(Data_grouped, outcome = mean(outcome, na.rm = TRUE)
Data_graph <- ungroup(Data_graph)

ggplot(Data_graph, aes(x = groupvar1, y = outcome, color = groupvar2)) +
        geom_line(aes(group = groupvar2))
```

OR

Via interaction.plot:

```
interaction.plot(x.factor = data$groupvar1, trace.factor = data$groupvar2, response =
data$outcome, type="b")
```